

Chemical Processing of Biogenic and Anthropogenic Organic Compound Emissions

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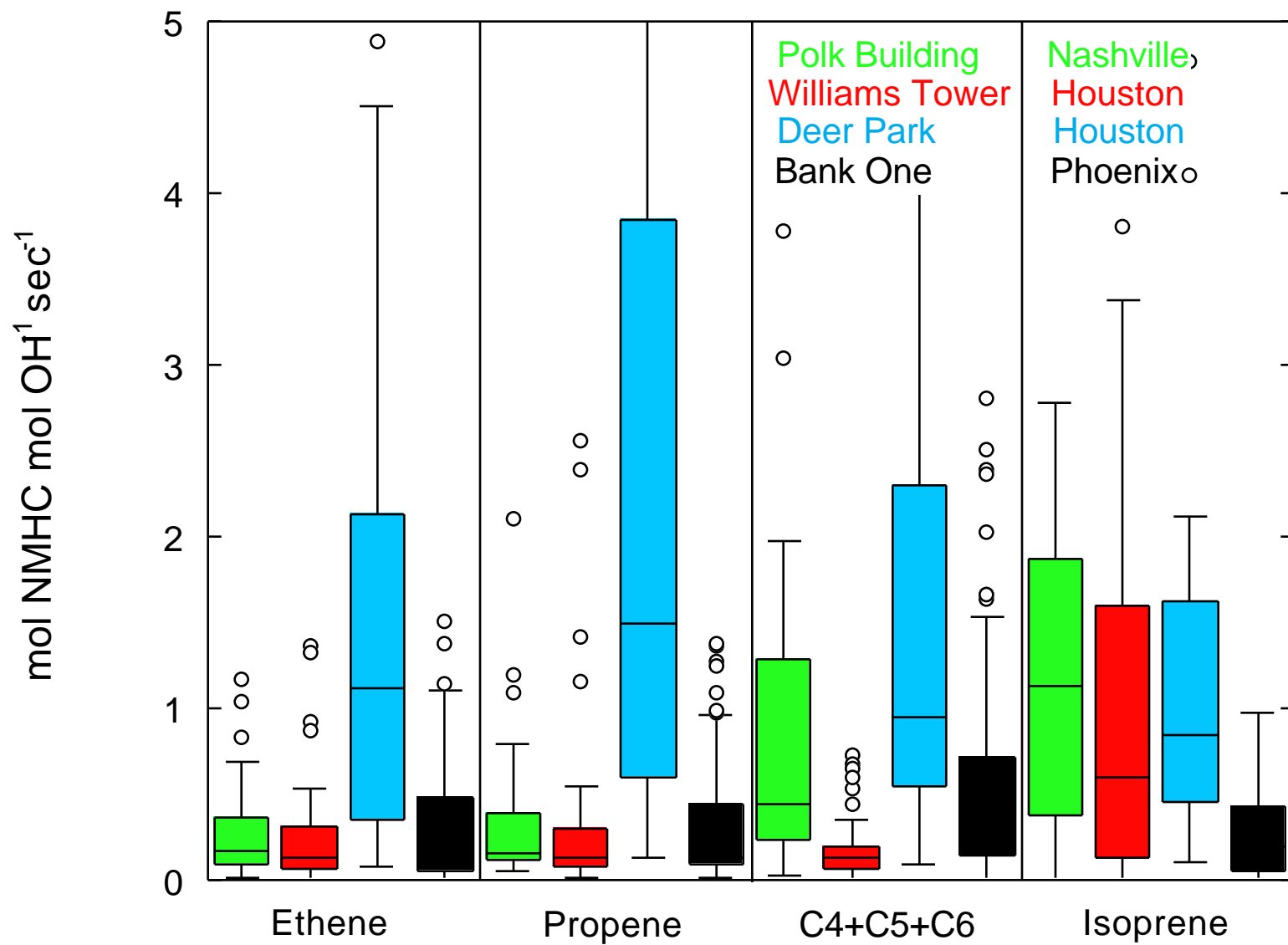
Source	Global Emission Rate (Tg C a ⁻¹)	
	NMOCs	Aerosol Precursors
Biogenic (vegetation, including agricultural crops)	1150	130
Anthropogenic (petroleum fuels — use, distribution, refining)	125	50

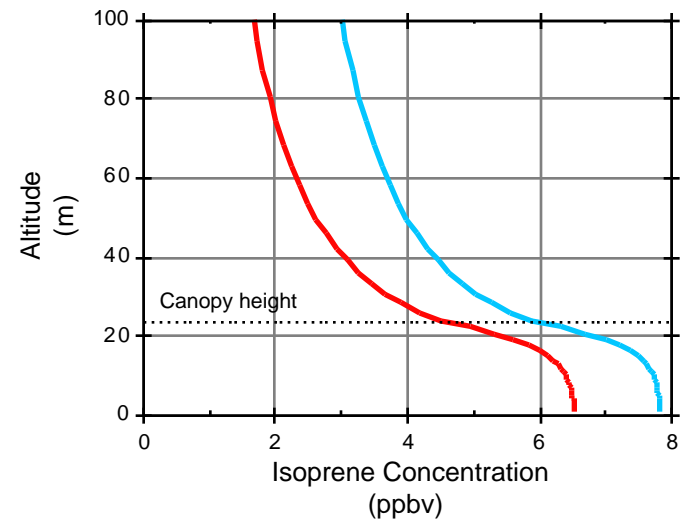
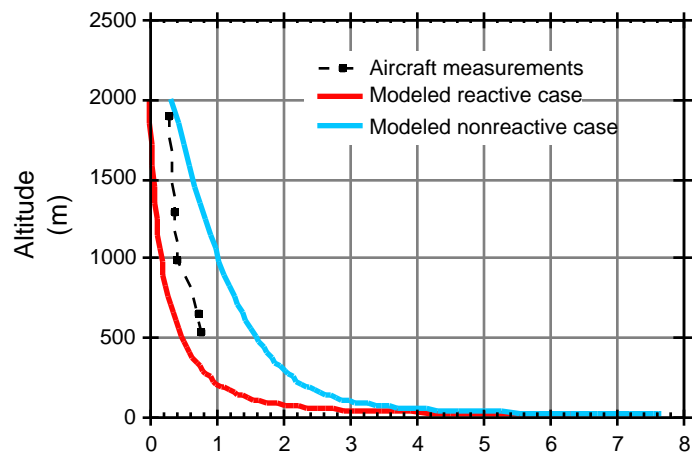
Chemical Processing of Terpene Emissions from Forests

CTEF I - Isoprene

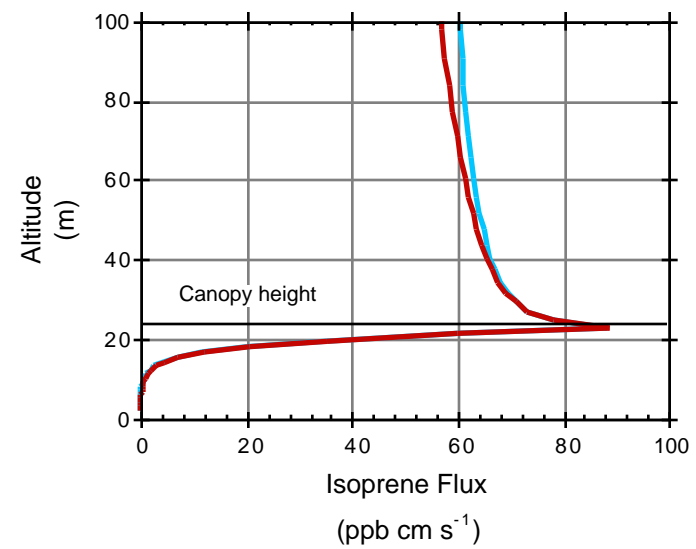
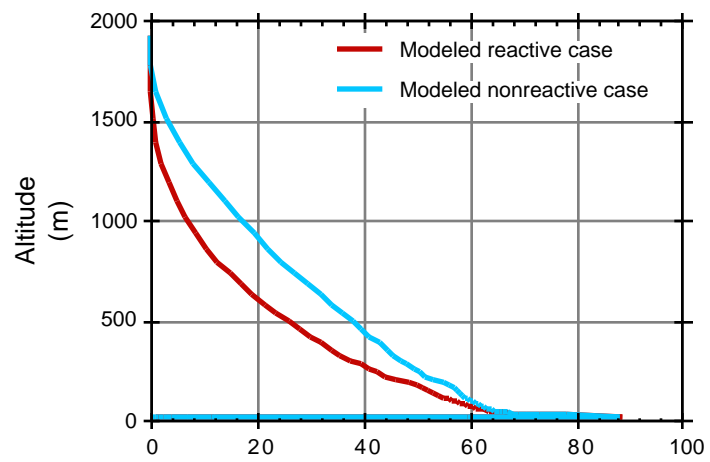
CTEF II - Monoterpenes

Chemical Processing of Aromatic Compound Emissions from Urban Areas





(Doskey, P. V. and W. Gao, J. Geophys. Res, 104, 21,263-21,274, 1999.)



CTEF I

Chemical Processing of Isoprene Emissions from a Deciduous Forest

- Intensive Field Campaign
- Diurnal Observations - Surface Sites, Aircraft, Tethersondes

Chemistry

Meteorology

Air-Surface Exchange

- Modeling Studies Atmospheric Chemistry

Transport

Chemical Measurements

- Vertical Profiles - Concentration and Flux

Tracer Experiments

Isoprene, Oxidants, and Oxidation Products

- Chemical Flux Measurements from Aircraft

Isoprene Sensor

Proton Transfer Mass Spectrometer

Potential Collaborators and Field Sites

- Collaborators

Alex Guenther - NCAR

Paul Shepson - Purdue University

Hal Westberg - Washington State University

ASP Investigators

Tom Jobson

Russell Dietz

- Field Sites

PROPHET

NE Texas

Ozarks

Central Valley of California

Field Measurements of Secondary Organic Aerosol Production

Definition - New organic aerosols produced from the chemical oxidation of gas-phase precursors

Aerosol Type	Global Emission Rate (Tg C a ⁻¹)
Secondary Organic	45-230
Carbonaceous Soot	5-20
Biogenic Sulfate	80-150
Anthropogenic Sulfate	170-250

Aerosol Yields

Chemical	Aerosol Yield ($\mu\text{g m}^{-3} \text{ ppb}^{-1}$)	Products
Monoaromatics ($\text{C}_7\text{-C}_9$)	0.140-0.580	Organic diacids,
Diaromatics	0.400-0.600	multifunctional carbonyls,
Monoterpenes ($\text{C}_{10}\text{H}_{16}$)	0.760	and organic nitrates
Sesquiterpenes ($\text{C}_{15}\text{H}_{24}$)	?	

Future Research Efforts

- Develop sampling methods that can efficiently separate the vapor and aerosol phases.
- Develop sampling methods that can make measurements over time scales similar to the time scales of changes in precursor emission rates and oxidant concentrations.
- Develop analytic techniques that can measure polar organic compounds in the aerosol phase.

Field Studies

- Locations

 - Coniferous Forest (CTEF II)

 - Urban Area - Mexico City, Houston

- Long-term monitoring - Seasonal Variations

- Intensive Field Campaign

 - Diurnal Observations - Surface Sites, Aircraft, Tethersondes

 - Chemistry

 - Meteorology

 - Air-Surface Exchange

- Modeling Studies Atmospheric Chemistry

 - Transport